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ABSTRACT

This paper addresses the role of distance education as a means for increasing curricular offerings of small and rural secondary schools. Treating distance education as a "technology" risks repeating the same cycle of false hopes and expectations that has historically accompanied the introduction of technology into education. Instead, efforts should focus on identifying effective educational practices specifically for distance education programs. During 1987-89, two projects were implemented by the Alberta Department of Education (Canada) to examine different approaches to distance education in secondary schools. The Distance Learning in Small Schools (DLSS) Project allowed students in a consortium of 28 small high schools to take courses not available in their schools. Each school was equipped with a fax machine and teleconferencing equipment. Assignments were faxed to teachers and results were faxed back. If students could not get help locally with a problem, they were free to phone or fax teachers. The Distance Learning Project North (DLPN) used a multi-class approach and computers to teach high school mathematic courses. Program evaluation identified distance education management issues related to teachers, support staff, facilities, equipment, finances, and program administration. Educational practices relevant to distance education that need further study include independent study, distributed classrooms, student support, and student motivation. (LP)

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Distance Education: En Route from Management to Pedagogy

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Introduction

The term distance education used in a variety of ways the common element of which is usually (though not always) physical distance between teacher and student. It is applied to traditional correspondence schools, to educational television, to audioconferencing, and to video conferencing, and has been extended by some to include associated issues such as open learning. The writer's interest in distance education is largely limited to its implementation as a means of augmenting the curricular offerings of small (and usually rural) secondary schools. The possibility of using distance education to augment offerings to small schools provides a link between distance education and sustainable community development. One desirable element in communities is access to a comprehensive education. Small communities often cannot afford to provide educational services that are comprehensive in nature. However, distance education appears to be a viable means of expanding the offerings of such schools. In Alberta over the past three years two projects were implemented to test various aspects of distance education in the secondary school setting. The writer was involved in the evaluation of both projects.

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In this paper I make three arguments: (1) By treating distance education as a "technology" we risk repeating the same cycle of hyperbole, false hopes and dashed expectations which in the past has accompanied the introduction of technology into education. (2) We have evolved a set of management techniques which facilitate the smooth operation of a distance education program within a secondary school, though one must admit that there remain certain tensions between the needs of the distance education program and the needs of the locally based program. (3) We have only scratched the surface of the pedagogical issues which accompany trying to accomplish through distance education curricular goals which assume a conventional school setting.

Beware the Snake Oil Salesmen

The original working title for this paper was Distance Education vs. the Snake Oil Salesmen. It grew from a perception that, in the context of the secondary school at least, there is a dearth of knowledge about distance education pedagogy that will comfortably match many of the goals contained in the curriculum. Instead of confronting this problem there is a tendency to believe that the media employed (usually referred to as the technology) in and of themselves will facilitate learning. One popular definition of distance education, for example, is that it is the use of technology to eliminate distance as a factor between instructor and students. A corollary to this definition sometimes posited is the more powerful the technology employed, the better will be the learning. This is an assumption, the acceptance of which flies in the face of history.

It is fascinating to study the history of educational media and find the recurring cycle of invention, evolution of educational applications, hyperbole, and disillusion which seems to have occurred with each new medium. Most of us are conscious of this cycle as it applies to educational computing, but fail to realize that it has accompanied the introduction of virtually every medium in the past century. Consider a couple of less familiar examples. In *The Optical Magic Lantern Journal and Photographic Enlarger*, T. Perkins (1893) writes

> No more important auxiliary to education has been introduced of late years than the optical lantern, which, by a process of evolution, has been developed from the magic lantern, which half a century ago was used almost solely to amuse children at Christmas and other parties.

Taunt (1894) in a letter to the editor, however, shows the other side of the coin.

> There are, no doubt, more exhibitions of lantern slides than in days gone past, but owing to several causes they are not looked up to as they used to be and it is natural that this should be so, when the rubbish in the form of slides is taken into consideration. Since the advent of dry plates everything in connection with photography has grown cheaper, slides included; and the vary facilities which these plates allow, has brought a lot of cheap (and nasty) productions in this way into the market.

Obviously we did not have to wait for the advent of the computer to get cruddy software. By 1913, the medium of interest had shifted from slides to motion film. On July 9, 1913, Thomas Edison was quoted in New York's *Dramatic Mirror* as saying,

> Books will soon be obsolete in the schools. Scholars will soon be instructed through the eyes. It is possible to teach every branch of human knowledge with the motion picture. Our school system will be completely changed in 10 years. (Quoted in Saettler, 1968.)

That was the hyperbole of 1913. The disillusioned version is supplied by Gregory in 1922.

> Educational films for schools comprising stories, technical subjects, travel, geography, history, language, and hygiene. The group of films especially prepared for school use is very small. Most of the so-called educational film consists of material that has been stripped from cast-off commercial film and retitled, and is being offered now for school purposes. Much of the film is shown in schools because of the novelty of the motion picture. In the effort to keep pace with the commercial exhibitor the schools frequently have disregarded quality. Experienced and skilled educators have given the film material but comparatively little attention. The material has been too often accepted without protest if it is low priced. (Quoted in Saettler, 1968.)

The next two major media developments were educational television and the computer, and both suffered the invention- to-disillusionment cycle. However, a parallel strand of technology developed concurrently with these two media, viz., attention to the systematic design of instruction. What instructional design has successfully given us is a set of tools to help in the preparation of content in certain areas that will facilitate learning, those areas being largely skill development, both in cognitive and psychomotor domains.

The marriage of instructional design with media production indeed led to more effective instructional media.

The research associated with these technologies did have a pernicious side-effect. In the context of this research was born the notion of "traditional education" as the straw man against which mediated instruction would be compared. The measure of effectiveness became whether mediated material "worked" better, the same or worse than a teacher. The result was to foster competition between teachers and technology with neither side having much appreciation for the other.

The foregoing is also relevant to distance education because it is technology dependent. Without some awareness of the history of educational technology, we risk becoming trapped in the cycle also and miss opportunities to enhance secondary education. Therefore we must keep in mind two caveats. The first is, beware exaggerated claims for the technology. The second caveat is, beware comparing the results of distance education with a hypothetical ideal classroom. In the same way in which educational television and computer assisted instruction were compared with a "live teacher" it is tempting to compare distance education to education in a "real" classroom. This comparison is frequently supplemented by the assumption that all education in "real" classrooms is of a superior quality. This is unfair for a number of reasons. First there are students who are more comfortable studying in distance education courses than in courses taught locally. Second, for some types of content distance education materials are superior to those normally available in the classroom. Third, and probably most important, in many instances the point of comparison should not be with a hypothetical ideal but with nothing--without the distance education version of the course there would be no course available to students in the small school.

Is there a mind-set that can help us break free of the problems which have plagued the introduction of technology into mainstream education for a century? One suggestion would be to forsake the dominant conception of distance education as a method and to shift the emphasis from method to condition. In other words, distance education is first and foremost education. Second, it is education in a setting in which a particular set of constraints must be overcome. To describe the constraints merely as "distance" is not particularly useful at the level of curricular goals. Of more interest, is understanding the impact of the constraint upon those goals and asking the question, "Given the goal, the students, and the constraints, what teaching techniques are appropriate to achieve that goal?"

Managing Distance Education in the Secondary School

Though an over-simplification, it is convenient to divide distance education methodologies into two types: independent study and distributed classroom. The independent study approach leaves the students to work largely on their own using materials specially prepared for the purpose, commonly print materials supported by such other media as audiotapes, videotapes, and computer assisted instruction. Tutors are available to assist the students and mark their work and may be contacted in a variety of ways including telephone, FAX, and electronic mail. In contrast the distributed classroom approach tries to build communicative linkages between students and teacher(s) in a fashion akin to a real classroom, i.e., to foster interaction among the parties involved and to use that as a means of instruction. Typically the linkages are provided through audioconferencing which must be done in real time, or through electronic mail and electronic bulletin boards in which communication can take place without the parties being linked simultaneously.

The administrative structure to support either or both approaches can take four forms: (1) local multi-class, (2) small clusters of schools, (3) consortia, or (4) wide-area, or province-wide. In many ways the notion of the local multi-class is an alternative to distance education rather than an actual form of distance education. By shifting the burden of teaching from the teacher to independent learning materials, it is possible to have many subjects being studied in the same room at the same time supervised by the same teacher. An example would be a small school that does not have sufficent teaching resources to offer all eight mathematics courses of the Alberta High School curriculum if the teaching is to be the primary source of instruction. By shifting to independent study with appropriate materials several mathematics courses, if not all eight, could take place simultaneously. In this case the teacher's role shifts from its traditional one to that of supporting the students in a variety of ways such responding to problems when they arise and introducing material that is known to be difficult. The roles of tracking, testing, and marking in this case can be given over to a computer managed learning (CML) system.

A second approach to distance education in the secondary school could be an arrangement to share staff among two or three schools within the same school district. Teachers in one school teach students in another school within their subject specialties. The general approach can be either independent learning in which the teacher serves as tutor/marker for students in the other schools, or distributed classroom in which all the students would be linked in a teleconference.

A third approach is the consortium. Whereas the small cluster would probably take place within a single school district, consortia assume that a number of school districts will be involved, and that there will be the need for tutor/markers dedicated to the distance education plus an adminstrative structure to coordinate the services.

The final approach noted was that called wide-area in which distance education services cross many school districts and may be province-wide or even inter-provincial. The services of such agencies as the Alberta Correspondence School and ACCESS radio and television are examples of a wide-area approach to distance education.

During 1987-89, two projects were mounted by Alberta Education to test various approaches to incorporating distance education in secondary schools. One was the Distance Learning in Small Schools (DLSS) Project which tested a consortium approach, and the other was called Distance Learning Project North (DLPN) which, for the most part, tested the multi-class approach, though some other elements of distance education were tried. The DLSS project in its first year involved 13 small high schools in the south-eastern quadrant of Alberta, and expanding to 28 schools in the second year. Each school was equipped with a FAX machine and teleconferencing equipment and tutor/markers were engaged on a full or part-time basis to cover most subject areas in the Alberta high school curriculum. Students wishing to take courses not available locally could register for the distance education version. The materials used were those produced by the Alberta Correspondence School. Assignments were FAXed to the tutor/markers and the results were FAXed back. This led to the comment in some quarters that this version of distance education was little more than "correspondence school with a faster mailman". The fast turnaround time, however, was a significant improvement over the three week turnaround time associated with correspondence school. If students could not get help locally with problems, they were free to phone or FAX the tutor/markers. Though a small amount of teleconferencing took place, the predominant form of instruction was independent learning. The general reaction of the students was positive. A few actually preferred it to classroom instruction for a variety of reasons. Most, however, felt that, though they would have preferred to have the courses available through classroom instruction, the distance education versions offered them opportunities which they otherwise would not have had.

Distance Learning Project North largely concentrated upon the implementation of a CML system as an aide to teaching mathematics. The materials used were again those developed by the Alberta Correspondence School; the CML system introduced was that developed by Computer Based

Training Systems which now runs on the Digital MicroVAX 3000 series computers. Besides CML, some DLPN schools explored the small cluster model for one or two subjects.

It is not the intent of this paper to report on the evaluation of the two projects. Evaluation reports for both are available from the Learning Resource Distribution Centre of Alberta Education (Clark and Schieman, 1990; also Clark and Haughey, 1990). For purposes of this paper the most significant outcome of the projects was (1) the lessons learned about managing resources for distance education in secondary schools and (2) the evolution of the perception that we have much yet to learn about pedagogy in the context of distance education.

The management of distance education must be concerned with seven categories of resources: (i) teachers, (ii) support staff, (iii) facilities, (iv) library/media centre, (v) equipment, (vi) finances, and (vii) administration.

Teachers. There are at least four roles which teachers play in distance education. One role is that of consortium teacher (or tutor/marker, as they were called in the Alberta projects). Here the teacher is responsible to the consortium for teaching a subject to students in some or all of its schools. If the dominant instructional method is independent learning, the teacher may be referred to as a "tutor/marker". But the instructional approach might also be that of distributed classroom with a significant portion of teaching being done through such means as audioconferencing.

A second role for teachers is as a teacher with primary responsibilities in one school but teaching students in one or two other schools as part of a small cluster arrangement. Again the teacher is involved with either or both of the dominant distance education models.

A third role for a teacher is in the context of a multi-class environment. Here the dominant instructional approach is independent learning probably supported by a CML system. In this case the role of teachers is a supportive, facilitating one in which they tend to deal with problems as they arise or to head off anticipated problems by introducing difficult material in advance of the students encountering it in the independent learning units. This is a very demanding role for teachers since the body of content from which problems may arise at any one time is considerably larger than in the traditional classroom. It also requires familiarization with the CML system to make best use of such capabilities as report generation.

The final role which a teacher has in distance education is that of local support either on a formal or informal basis. Even with telecommunications between students and tutor/markers, it is desirable to have a local teacher or teachers to whom students can turn as a front line of assistance. Formally teachers may be assigned to supervise the distance education room as part of their teaching load, or have students approach them informally if they are known to be knowledgeable in an area requiring assistance.

One point which should be made about all teacher roles within distance education is that they are foreign to teacher training. The fact that they may be skilled and knowledgeable about the traditional classroom does not necessary mean that they will be either comfortable or skilled in distance education. Teachers being asked to become involved with distance education for the first time should be provided with appropriate inservice.

Support Staff. Providing support staff for a distance education program includes making provision for clerical, maintenance, and coordination functions. Decisions must be made about whether students will operate the FAX machine themselves, for example, or whether it will be done by school staff. Records must be kept not only of marks but of transmission and receipt of assignments. Glitches in telecommunications can result in lost assignments. Maintenance of equipment may be handled on a contract or walk-in service basis, or in a consortium it may prove more cost effective to have a maintenance technician for the consortium. Finally local coordination of the program must be considered including registering of students, acquiring materials, and maintaining links with the tutor/markers. For convenience support has been listed as a matter of functions to be performed rather than a listing of staff positions. The actual staff configurations used to approach these functions may differ from school to school. In the DLSS project, for example, various configurations of professional staff, secretaries, and teacher aides were employed successfully.

Facilities including School Library. Unlike versions of distance education in which students work independently at home, incorporation of distance education into a school makes an impact upon the physical plant. Students must have a space to study, preferably in a room set aside for distance education and equipped appropriately. Such a space should make provision for independent study and small group work. It must also provide for teleconferencing such that others working will not be disturbed by a teleconference session. It is convenient if the FAX machine is located in the space provided for distance education. Space is also required to house resources, audiovisual equipment, computers, etc. Proximity of distance education space to the library/media centre is ideal in that this is the traditional

location of resource material and equipment in a school. When distance education is introduced into a school, special attention must be paid to the needs of the school library given that students may require extra resources for courses not previously available. For example, if students are taking art in a school where it was not previously available, there will probably be need for the school library to acquire such reference works as a book on art history.

Equipment. Depending on the nature of distance education being implemented, the needs for equipment will vary. Core equipment appears to be a FAX machine and a telephone. If audioconferencing is to be implemented, then a teleconferencing convenor is required. Television broadcasts will probably require a satellite dish. Other possible equipment requirements include a microcomputer and modem for electronic mail and a CML system and the computer hardware to run it.

Finances. Adding a distance education component to a school is not without cost. Budgetary items which must be addressed include capital costs, staff, telecommunications, supplies (both consumables and non-consumables), equipment maintenance, and purchased services (where marking services, for example, are purchased from a consortium). Those interested in a comparison of costs between distance education and traditional education are referred to the evaluation of Phase 2 of the Distance Learning in Small Schools Project (Clark and Schieman, 1990).

Administration. Administration is a matter of concern at all levels in a distance education system. At the local level it is a matter of fitting distance education into the overall scheme of things in the school, assigning resources, monitoring progress, and engaging in trouble-shooting as the need arises. At the consortium level, it involves such matters as coordination of services among the members; acquisition, inservice and monitoring of tutor/markers; establishment of fee schedules. Particularly where consortia are involved, matters of administration can make or break an effective distance education program. Consider, for example, the fact that schools tend to have timetables which are independent of each other. Some schools operate on 45-minute periods, some on 60-minute periods, some on 90-minute periods. As long as they are operating independently of each other this is of no concern. However, when a tutor/marker tries to set up a teleconferencing session for students who are taking other courses locked into different timetables, it becomes very difficult to arrange. This more than any other factor brought a virtual end to the distributed classroom model in the DLSS project. It became impossible to schedule audioconferences when all the students who needed to participate could attend.

This, then concludes our look at management issues associated with the integration of distance education into the secondary school. On the whole, we know what has to be done to implement an effective program, particularly where the independent study model is adopted. Where the desired model is the distributed classroom, more difficulties of management nature tend to arise. It is simplistic to suggest that all would be well if schools adopted the same time-table or at least all set aside the same block of time each day for distance education courses. Most small secondary schools are contained within facilities housing grades 1 to 12 and timetabling is for the whole school, not just the high school. Further the time table may have to take into account such matters as visits from itinerant teachers in some specialty areas not to mention busing schedules.

Pedagogy

One of the conclusions drawn from the evaluation reports of both the DLSS Project and DLPN was that there was need to push beyond refinement of the management of distance education to concentrate upon developing appropriate pedagogical techniques. There are at least four categories of pedagogical techniques needing to be explored: those specific to independent study, those specific to the distributed classroom, those associated with student support in both models, and those associated with motivation in both models. An assumption underlying the recommendation to pursue pedagogy is that a substantial measure of equivalence should exist between courses as they are normally taught in high schools in Alberta and the versions of those courses taught through distance education. Curricular goals cross cognitive, psychmotor, attitudinal, and interpersonal domains. Independent study is appropriate for only some of these domains (in particular skills), and there exists a temptation to revise the curricular goals to match this one distance education model. Taking this approach has made it possible to enrich the offerings of schools beyond what they could offer previously. Therefore one should be cautious about being overly critical. Nevertheless, revising goals to match methods ought to be a short-term solution while we seek the means of addressing those goals which we cannot now meet.

Independent Study. Of the two dominant approaches to distance education, we are most knowledgeable about preparing materials for independent study. Over three decades a considerable amount of knowledge in the area of instructional design has been amassed and this knowledge is being applied to preparation of effective materials. One has only to compare the instructional modules in the variety of media formats presently being developed by the Alberta Correspondence School with previous versions to recognize the

strides which have been made. As noted earlier in this paper, however, instructional design techniques are most refined in the area of teaching skills. As one moves away from skills content, for example into areas of aesthetics and moral development, one becomes less secure in the application of these techniques. Furthermore it is still possible to produce very well designed but dreadfully dull instruction. This leads into the topic of motivational design for distance education which will be addressed briefly below.

Distributed Classroom. The rationale for the distributed classroom approach to distance education is provided by curricular goals which are dependent upon communication among groups of students. In some instances, such as in the Career and Life Management curriculum or in Social Studies, the process of the interpersonal activity represents a curricular goal in itself. We have noted above that this model of distance education poses administrative problems because of timetabling (not to mention telecommunications costs). An alternative which would circumvent "real time" problems would be the use of electronic bulletin boards. Computer mediated communication, however, is just becoming an area of interest for researchers, and we are not sure at this point what the effects upon communication are when one moves from the spontaneity of "live" communication to that of delayed and edited communication. One can hypothesize that the different forms of communication would be appropriate for different educational goals. Addressing issues of the absence of body language in audioconferencing and its effect on teaching and finding alternatives if they exist warrants further explanation.

It should be noted that curricular areas for which a particular distance education model is effective may not be intuitively obvious. For example, it would seem that second language teaching would be most effectively done using a means such as audioconferencing. However, there is a considerable amount of dependence upon visual cues in language learning, and the time constraints of audioconferencing do not permit much practice on the part of each individual. For this reason one must question whether audioconferencing is appropriate in this instance. One might well argue that an alternate approach be followed for beginners and reserve the distributed classroom for advanced students.

This paper has focused upon audioconferencing as the dominant form of distributed classroom. This has been done because it seems the most likely form to be employed at this time in schools in Alberta for reasons of cost. The addition of an audiographics system enables computer graphics to be transmitted on the same telephone lines as the audio signals which can enhance audioconferencing considerably. We have not considered

one-way-video two-way audio which again enhances the distributed classroom. The reader is referred to the TI-IN network in Texas as an example of this implementation. No matter what form of the distributed classroom is employed, there is room for substantial research in the associated pedagogy.

Student Support. There are at least two areas of student support which need to be recognized when a distance education program is implemented in a high school, both of which stem from students' prior experience with schooling. First, only a small number of high school students appear by nature to be independent learners who function comfortably without extrinsic motivation. Schools embarking on distance education which left it up to the students to keep track of their work and keep up to date found many students getting behind and not finishing their program. (This incidentally matches the high incompletion rates associated with traditional correspondence education.) Most schools have resorted to a public tracking system such as a progress chart on the wall as a means of persuading students to keep up with their work.

Helping students keep up with their work in independent study is, in fact, a subset of a more general need for student support, viz., assisting them to adapt to the myriad of differences between the classroom and independent learning. For example, they need to be taught how to extract information from print materials, how to use audiovisual materials to get the most out of them, how to seek information and help, and how to engage in peer tutoring effectively. One of the biggest challenges is to help student make a mental switch from an environment in which everything important is taught by the teacher while the print materials are supplementary to one in which the important content is contained in the mediated materials and students must learn from them, getting supplementary help from teachers.

Motivation. The final area for consideration in this paper under the rubric of pedagogy is motivation. Motivation as a teaching technique in the classroom is largely restricted to attention capturing activities and to the communication of the teacher's enthusiasm for the subject. In distance education it is more difficult to implement these techniques. They do, however, represent a subset of techniques available. The individual who has probably done the most in recent years to systematize approaches to motivation is Keller (1987) with his ARCS model. The acronym stands for the for general categories into which he places motivational techniques: Attention, Relevance, Confidence, and Satisfaction. To explore this model in any depth is beyond the scope of this paper. Suffice it to say that Keller and his associates have laid solid groundwork for approaching motivation both in the classroom and in the

application of instructional design techniques. Work is only beginning on extending his model into distance education, but it does offer promise.

In Conclusion

The theme running through this paper is first that we must be careful not to become so enchanted with the gadgetry of distance education that we overlook the key elements of management and pedagogy. From such experiences as the two distance education projects in Alberta we have gained considerable expertise in the management of distance education as it is applied to extending the offerings of small high schools. Having travelled this far, the journey should pursue refining the pedagogical techniques which may be applied in distance education.

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